

ART. V. A NEW TERRESTRIAL VULTURE FROM THE
UPPER EOCENE DEPOSITS OF WYOMING

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(PLATES I-V)

During field work under the direction of Dr. John Clark in Sweetwater County, southeastern Wyoming, in the season of 1941, the Carnegie Museum secured a partially complete skeleton of a remarkable bird that, through the kindness of Dr. A. Avinoff, Director, and Dr. J. LeRoy Kay of the Section of Vertebrate Paleontology, has been forwarded to me for study. Skulls of birds in fossil state are rare, so that most of our knowledge of the extinct avifauna of the World comes from wing and leg bones. The present specimen has a skull in a good state of preservation, and with it are associated parts of enough of the skeleton (*see* plate II) to give a fairly complete representation of the most remarkable bird that has come to my hands for description and a name. The species is one that belongs among the vultures of the New World in the Suborder Cathartae, and one that introduces an entirely new type of bird into that assemblage. Its form and specialization are of a kind that has not been suspected, since it is most anomalous to encounter in this group of species, marked by their ease and skill in flight, a relative that is evidently specialized for life on the ground, in which the ability in soaring, so highly developed in its relatives, was certainly entirely absent.

According to data given to me by Dr. Clark, the specimen was embedded in a relatively fine sandstone that was fairly soft in character, in the upper part of the Washakie formation of the Upper Eocene. The skeleton apparently had been overturned in some way before becoming finally embedded prior to fossilization, since the under sides of several bones were mechanically fractured. The specimen has been prepared with great skill so as to preserve delicate structures that if lost would have left the relationships of this strange bird in considerable doubt. As it is there is no question as to its affinities.

The drawings illustrating this specimen were made by the late Mr. Sydney Prentice of the Carnegie Museum. In addition, Walter A. Weber of the U. S. National Museum has prepared under my suggestion a restoration of the bird as it may have appeared in life.

The species may take its place in the group of others known from the Eocene under the name of

Eocathartes grallator, gen. et sp. nov.

Characters: A bird of the suborder Cathartae, with degenerate wings, heavy pelvis, long legs, and large skull with large orbits, large narial aperture and strong premaxilla and mandible; longitudinal axis of mandible nearly straight, not decurved; lachrymal fused with the frontal; narial region open, and the olfactory cavity relatively large; palate exhibiting the arrangement of indirect desmognathism that marks the Cathartae as a group; processes for muscular attachment on the cervical vertebrae large and strong; pectoral girdle weak, with coracoid relatively small and non-pneumatic; tibio-tarsus long and heavy; tarso-metatarsus long and slender; anterior toes relatively long and strong; hallux weak, and apparently with a slightly elevated attachment on the shaft of the metatarsus.

Description: Type, a partial skeleton, Carnegie Museum Department of Vertebrate Paleontology, no. 9377 (field no. 2-35, 1941), from the Upper Washakie deposits of the Eocene, collected from the east bank of the main sand wash, one-half mile north of the Dobe Town road crossing, Sweetwater County, Wyoming, by H. Stoll, August 21, 1941.

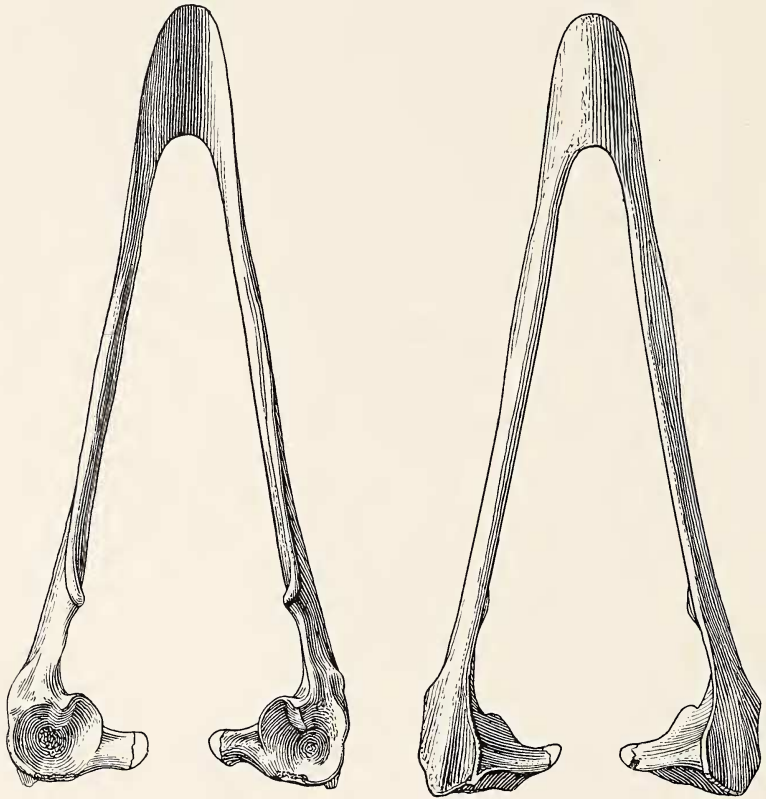
Skull: (Plate III, figs. 1-3; text-figs. 1, 2). Right side fairly complete, with slight displacement of quadrate and adjacent bones; anterior part of frontal damaged except along orbit, left side forward to nasal mainly missing except for quadrate, with a section of the quadrato-jugal still partly buried in the matrix. Cranium relatively broad, with indication of brain capacity apparently equivalent to that of modern species of the suborder Cathartae; basal portion distorted or missing; squamosal relatively small but strongly developed; temporal fossa large; post-orbital process much stronger and heavier than in modern Cathartae; orbital opening large (anterior margin on right side displaced by crushing); lachrymal of moderate size, fused with the frontal, with a large opening through its inner base for the passage of the olfactory nerve; nasal with descending process slender; nasal process of premaxilla also slender; narial opening decidedly larger in proportion than in modern Cathartae; premaxilla anterior to the narial opening strong, with a decided hook at the end, vaulted on the lower surface, so that the lower margins are sharp edged; maxilla relatively large, with a well-developed depression for the articulation of the maxillary process (the superior anterior division of the

maxillo-jugal, which is not preserved in the specimen), this depression involving the upper margin of the maxilla and the lower anterior end of the nasal; quadrate large and heavy, with two well developed heads; the squamosal facet broad and heavy; the opisthotic facet somewhat smaller, but relatively of good size; the orbital process broad and strong; anterior end only of the right pterygoid exposed, this being rather slender, with slightly expanded anterior end; a basipterygoid process indistinctly evident; quadrato-jugal rather strong, with a well developed articulation with the quadrate (the anterior end fragmentary); palatines relatively broad, scroll-like behind, broader and heavier anteriorly; free portion of maxillo-palatines apparently small, with the anterior margins closely applied to the palatines (as in modern *Cathartes*); posterior portions on either side joined through ankylosis with the nasal septum. Total length (approximate) 124.5 mm.; distance from cranio-facial hinge to tip of premaxilla (approximate) 68.0 mm.; depth of premaxilla at center of narial opening 18.5 mm.; length of maxillo-jugal (approximate) 59.0 mm.

Mandible (plate III, fig. 3; text-figs. 1, 2) complete, except for articular portion of left ramus, and some parts of the adjacent posterior section. Posterior margin truncated, and the posterior mandibular process developed only as a slightly indicated crest, with the surfaces internal to it irregularly and shallowly concave; internal mandibular process strong and heavy, with truncated end; external mandibular process a roughened, elongate, heavy-based ridge; articular surface deeply and irregularly concave; upper margin of mandible, viewed from the side, nearly straight to the symphysis, there being only a very slight downward curvature at the middle; coronoid process slightly developed; external face of ramus somewhat excavated posteriorly, with a narrow, elongate, closed depression marking the location of the anterior foramen found in some birds; symphysis fairly heavy. Total length (approximate) 104.5 mm.; depth of ramus at widest point (through the angulare, slightly anterior to the coronoid process) 16 mm.

The fused lachrymal, the condition of indirect desmognathism formed by the fusion of the inner margins of the maxillo-palatines on either side with the nasal septum to form a transverse bridge above the palate, and the depression in the posterior margin of the maxilla for the articulation of the upper anterior division of the maxillo-jugal, are characters that mark members of the suborder Cathartae from other birds. The skull as a whole is relatively large, and the premaxilla strong, with the articulation for the anterior dorsal end of the maxillo-jugal, together with the well-

developed orbital process of the quadrate, indicating a well-developed, flexible cranio-facial hinge. The narial aperture is as large as that of the South American condor, though the skull itself is much smaller. It seems



FIGS. 1, 2. Dorsal and ventral views of the lower mandible of *Eocathartes grillator*, natural size.

quite probable that the nares in life may have been pervious. The texture of the surface of the cranium, with the relative size of the irregular furrows for blood vessels that extend from the margin of the posterior part of the orbit, when compared with other Cathartae, make it probable that the head was covered with a thickened skin and therefore bare of feathers.

The strong bill appears straighter, less decurved than in the other Cathartae, though this condition may have been modified somewhat by distortion during fossilization.

Tongue: The two basi-branchials (plate IV, fig. 1) of the tongue are present, having been found in place by the preparator. The shaft in these is slightly curved through distortion, rounded and slender, and at the proximal end is flattened and expanded to form the articulation with the basihyal. Adherent to the left side of the atlas vertebra is a slender stylus of bone that may represent the distal part of one of the cerato-branchials. Length of the longest basi-branchial 37.9 mm.

The presence of these parts of the tongue is unusual as they have seldom been found in fossil birds.

Pelvis: The fragments preserved include the line of fused vertebrae (plate IV, fig. 4) with the anterior and some of the posterior parts of the ilium, a partial ischium, and part of the pubis on the right side. The bone is large and strong, being approximately one-third larger than the pelvis in *Cathartes aura*, and is of decidedly heavier form. The form has been considerably distorted during fossilization, so that not much detail, aside from size and evident strength, is available for description. The pre-acetabular portion of the ilium appears to have been more angular than in living *Cathartae*, to afford attachment for larger, stronger muscles. The fused sacral vertebrae form a decidedly longer element in the pelvis, and the ilio-ischiatic fenestra is longer. The general appearance is one of strength to support a heavy musculature. Along the line of the vertebrae the bone as preserved measures 118.5 mm., but in life it was probably appreciably longer.

Vertebrae: The line of cervical vertebrae, more or less broken, is evident in the photograph of the skeleton as it lay in the matrix before removal (see plate II). The fragmentary atlas (text-figs. 3, 4) includes the dorsal section—the neural arch above the spinal canal, which is relatively long,



FIGS. 3, 4. Anterior and lateral views of the atlas and axis of *Eocathartes gallinor*, natural size.

resembling a fairly heavy collar. The lower part carrying the articulation for the reception of the occipital condyle of the skull is missing. The portion present measures 10.6 mm. in transverse diameter.

The axis (text-figs. 3, 4) is relatively strong and heavy, with the hypo-

physis produced ventrally as a strong plate (relatively much larger than in living *Cathartae*), and the neural spine also heavy (distal end missing). The odontoid process is relatively strong.

Possibly nine other vertebrae which belong in the cervical series are represented by fragments, though with one exception these are so broken and distorted that they cannot be certainly identified. The only one that is fairly complete seemingly is the twelfth cervical (text-figs. 5, 6). This



FIGS. 5, 6. Dorsal and lateral views of twelfth cervical vertebra of *Eocathartes grallator*, natural size.

differs from the corresponding bone of modern *Cathartae* in having a flattened, bladelike hypophysis of good size. The neural spine is rather low but is strong and heavy. Another fragment seemingly represents the dorsal part of the eleventh cervical (text-fig. 7). The other bits preserved do not present identifying characters.



FIG. 7. Dorsal view of the eleventh cervical vertebra of *Eocathartes grallator*, natural size.

The indication from the vertebrae is that the neck was stronger than it ordinarily is in the *Cathartae*, with the processes for muscular attachment decidedly larger and heavier. This is shown by the relative size of the atlas and the axis, and by the large hypophysis on what is believed to be the twelfth cervical. This is quite different from the low process in the living species.

Ribs: A few fragments of the ribs have been preserved but show no characters of interest.

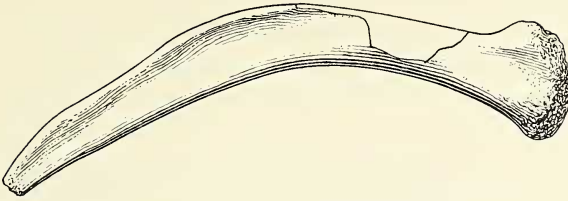


FIG. 8. Dorsal view of scapula of *Eocathartes grallator*, natural size.

Scapula: The articular end and the blade of one scapula (text-fig. 8) were found. These are flattened somewhat, and have been modified so that their original form is obscured. Apparently they belong to the right side. The bone is slender, with the head relatively small, and the distal section lightly formed. It appears to have been longer, and more attenuate proportionately, than in living *Cathartae*.

The scapula appears thus decidedly weaker than in the living, flying species, an indication of a poorly developed wing.

Coracoid: A considerably distorted coracoid (plate IV, fig. 2) apparently represents the bone of the right side. It is slender, more similar to this bone as it is found in galliform species than in the *Cathartae*, being so different that if disassociated from the present skeleton its true affinities would not be recognized. The head appears small and little developed, the shaft remarkably slender, and the bone relatively short for the size of the bird. The sternal facet is narrow and weak, though apparently fairly long. The bone appears to have been non-pneumatic. There is present also the fragmentary distal section of the left coracoid which bears out the slender, weak form described above. At its narrowest point the shaft in the complete bone is only 5.6 mm. in transverse diameter, and seemingly was only about 60 mm., or very slightly more, in length.

The appearance of the coracoid is such as to indicate at once that the bird was one of decidedly weak powers of flight.

Humerus: This element is represented by two distorted fragments that come from the left side (plate IV, figs. 6, 7), being in size between one-half and two-thirds the dimension of the turkey vulture. The head is missing, but, judging from the base of the shaft that supported it, it is evident that it was relatively small. The remnants of the deltoid crest indicate that this point of attachment for the left breast muscle was reduced in size and only lightly developed. The shaft is relatively slender,

and appears to have had a considerable sigmoid flexure. A small section of the shaft is missing below the center. The distal end shows a shallow, poorly defined, brachial depression, and indication of light development of the condylar area. The shaft appears rather heavy in relation to the somewhat expanded ends, the indication being that it may not have been pneumatic.

Ulna: The proximal end of the left ulna remains articulated with the humerus just described but is too broken to display useful characters. The proximal end of the right ulna (plate IV, fig. 3) preserved is considerably crushed so that the shaft is flattened, while the outer layer of bone is largely missing from the anconal surface because of abrasion. It is a slender bone, about one-half the size of that of *Cathartes aura*. The olecranon (somewhat abraded) is broadly rounded, the internal cotyla a shallow cup, and the shaft of the bone is relatively slender. The raised area for the attachment of the anterior ligament appears disproportionately heavy, the depression for the attachment of the brachialis anticus is well marked and fairly long, and the intermuscular line faintly indicated.

Carpometacarpus: A fragmentary bone from the right side (text-figs. 9, 10) lacks practically all of the first metacarpal except for the articular facet for the pollex. The bone is about one-half the size of that of the modern turkey vulture. The second metacarpal is rather slender, with no marked processes or lines evident, though these may have been partly obliterated by crushing. The distal end is truncated, with only a slightly projecting tuberosity. The intermetacarpal tuberosity shows a very slight elevation near the center of the shaft, and the tendinal groove while fairly wide is very shallow and faint. The third metacarpal, while somewhat flattened by pressure, appears disproportionately large in relation to the size of the second. It is flattened, and forms a distinct downward arc of a more decided sweep than is usual. The distal symphysis that joins the second and third metacarpals is relatively broad, and the distal end of the bone is truncated. From the articulation for the pollex to the distal end the bone measures 37.4 mm.

Pollex: This is somewhat distorted but was found in position. It is a slender, attenuate stylus that terminates in a fine point. While its total length may have been slightly increased by crushing, this could not have enlarged it greatly so that its extent over more than one-half of the length of the second metacarpal is surprising. The base is fairly heavy, and the distal tip finely attenuate. As preserved it is 22 mm. long. The indica-

tion is that the alula, in comparison with the remiges, may have been of larger size than customary in modern birds.

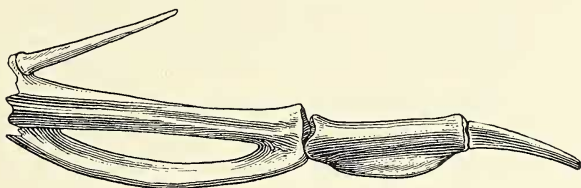


FIG. 9. Outer aspect of part of right carpometacarpus, pollex and digits of *Eocathartes gallator*, natural size.

Manus: The first phalanx of digit 2 is long and relatively narrow, being 21.8 mm. long by 7.5 deep at the widest point. The second phalanx of this digit is missing. The third digit is a narrow, elongate style that from a narrow base tapers to a point, the tip of which has been broken and lost.

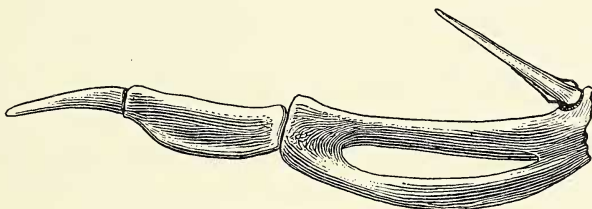


FIG. 10. Inner aspect of part of right carpometacarpus, pollex and digits of *Eocathartes gallator*, natural size.

While the wing is only partly preserved, the entire picture that it presents is one of much reduced function, more so than is the case in most ground living species of birds. The general proportions of the wing, so far as they may be ascertained, are not unlike what is found in the road-runner (*Geococcyx californianus*), a ground-inhabiting cuckoo that walks or runs as its habitual method of progression, but that can spring into the air, if necessary, to sail away on its wings. *Eocathartes* apparently was almost entirely terrestrial, though its wings may have served to carry it away from sudden dangers. While not entirely flightless, the condition presents an amazing contrast with the wing development and use in the other Cathartae.

Femur: Parts of shafts of the two femora were found, both with the ends broken so that they offer comparatively little descriptive data, except that they indicate a development different from that which is normal

among the living New World vultures (plate IV, fig. 5). The intermuscular lines are long and well marked, and the trochanteric ridge seems to have been heavy. There is no indication of the pneumatic foramen below the trochanter, though it is barely possible that this was located in the section missing from this area. The shape of the shaft indicates a strong, elongated form, with the axis nearly straight.

Tibiotarsus: The right tibiotarsus (plate V, figs. 1-4) is present, except for the proximal end. The shaft is distorted, and the distal end more or less modified by pressure. The length and heavy build of the bone are remarkable compared to that of modern forms, it being nearly twice the length, and even more than twice as heavy, than the tibiotarsus in *Cathartes aura*. The external condyle has the rounded form of *Cathartes*, but the shaft above is much heavier. The fragmentary inner condyle, so far as present, is also like *Cathartes*, with an equally large internal ligamental prominence. The intercondylar sulcus is deep, wide and open. The supratendinal bridge has been broken away, but seemingly was wide, as would be expected. The very strong, heavy shaft is fairly straight, and on the upper section has the outer cnemial crest broken off, but bent back and adherent to the main shaft. There is indication also of a part of the fibular crest, and of the long, slender style of the fibula, in which the head and the distal end are missing. The total length seemingly must have been near 210 mm. The external condyle measures 16.5 mm. across, and the bone as preserved measures 17.4 mm. transversely across the condyles.

Tarsometatarsus: The right metatarsus (plate V, fig. 5) is partly preserved with the shaft and most of the middle trochlea present, with only bits of the lateral trochlea. The head and the posterior part of the bone are fragmentary or missing. The trochlea from the left side, somewhat distorted, is also present. The bone was remarkably long, being more than twice the length of that of *Cathartes aura*, and nearly twice that of *Coragyps atratus*. The shaft appears relatively slender for its length, with a well impressed furrow on the anterior face near its upper end. The middle trochlea is compressed laterally but is fairly large. The two lateral trochlea show strong form. The facet for the articulation of the hallux is very indefinitely indicated, but it appears to have been small and somewhat elevated. The inferior foramen was small, with a narrow, shallow groove leading into it on the anterior surface. The metatarsus seems to have been about 135 mm. long, with the shaft near the center approximately 8.5 mm. in transverse width.

Pes: The set of phalanges is not complete, but the thirteen bones pre-

served serve to indicate the size and form of the foot (plate V, fig. 6) with fair accuracy. Four of the total number are incomplete, and all are more or less worn so that allocation to right or left sides is not attempted.

The first digit, or hallux, has the basal phalanx missing. The second phalanx is relatively small and slender, and the unguis phalanx, while well developed, appears rather weak. The size is about as in *Cathartes aura*. The second phalanx measures approximately 5.9 mm. in length, and 3.2 mm. in transverse breadth at the center of the shaft, with the distal end 4.2 mm. broad transversely. The unguis is 11.5 mm. long. The appearance of these two segments of the hallux supports the supposition that the first toe had become somewhat weakened, as is usual in a running bird.

The second digit is represented by a basal phalanx with a fragment of the base of the second phalanx adherent to its distal end (though twisted in its attachment), and a complete second phalanx. The basal phalanx is decidedly longer and heavier than in *Cathartes aura*, being strongly developed with a broad, strong base. This bone measures 20.8 mm. in length, 5 mm. in transverse breadth at its narrowest point, 7.3 mm. in transverse breadth on the proximal end, and 6.4 mm. in transverse breadth at the distal end. The second phalanx is relatively more slender, being more as in *Cathartes*. It measures 18.9 mm. in length, 3.9 mm. in transverse diameter at the center, 5.1 mm. in transverse breadth at the proximal end, and 4.6 mm. in transverse breadth at the distal end.

From the third digit there is one first phalanx and part of a third with the claw attached. The basal phalanx is long, with a relatively slender shaft and a strong base. It measures as follows: length 29.4 mm., smallest transverse breadth of shaft 5.4 mm., transverse breadth of proximal end 7.7 mm., depth of proximal end 9.4 mm., and transverse breadth of distal end 7.8 mm. The proportions are much as in *Cathartes aura*, but the base is heavier. The third phalanx lacks about one-fourth of the proximal end. It is slightly heavier than in *Cathartes*, but may not have been a great deal longer. The transverse width of the distal end is 5.8 mm. The claw, which has the tip missing, is about as long as in *Cathartes*, but is slightly heavier.

For the fourth toe there are present one first phalanx complete, and about two-thirds of the other one, a third, and a fourth phalanx, and an unguis. The first phalanx is strongly built and heavy, being decidedly larger than in *Cathartes aura*. It has the following measurements: length 18.2 mm., transverse breadth at base 7 mm., transverse breadth near center 4.2 mm., and transverse breadth of distal end 5.6 mm. The second

phalanx is not preserved. The third phalanx compared with that of *Cathartes* is heavy, the bone being thicker and stronger. It measures as follows: length 9.5 mm., transverse breadth of proximal end 5.1 mm., of shaft near center 4.0 mm., and of distal end 4.5 mm. The fourth phalanx, which was found articulated with the third just described, exhibits the same relatively heavy form when compared with *Cathartes*, measuring as follows: length 12.2 mm., transverse breadth of proximal end 4.2 mm., of shaft near center 3.4 mm., and of distal end 4.1 mm. The unguis is relatively heavy. As stated above, its tip is broken and missing.

The heavier part of the leg seems to have been that part extending from the tibio-tarsus to the pelvis. The tarso-metatarsus is relatively slender, a comparatively slight construction that, in a way, is carried along to the toes. The appearance of the foot is somewhat similar to that of *Cathartes aura*, but the anterior toes are heavier and longer, the three anterior digits being actually larger, with heavier form. The hallux, on the contrary, is actually very slightly smaller, so that the proportions of the foot, as a whole, are somewhat different. The anterior toes, however, show distinct modification for terrestrial locomotion in their strength and length, while an allied modification appears in the decreased size of the hallux.

Taxonomic position: *Eocathartes grallator* is the strangest of the fossil birds that it has been my privilege to describe to date, its peculiar characters being of a kind unknown until now in the suborder Cathartae. The bird in the flesh lived in a completely different ecological niche from that of the vultures found in the New World today, its status in relation to the other known forms being comparable to that which the secretary-birds, the Sagittariidae, bear to the hawks, ospreys and falcons. The restoration (plate I) of *Eocathartes*, prepared under my suggestion by Walter A. Weber of the U. S. National Museum, has been based on a careful comparison of the fossilized bones with the skeletons of modern species of the family Cathartidae. In the development of a suitable background, with the hint of accessory vegetation, we have had the advice of Dr. Roland W. Brown, paleobotanist of the U. S. Geological Survey.

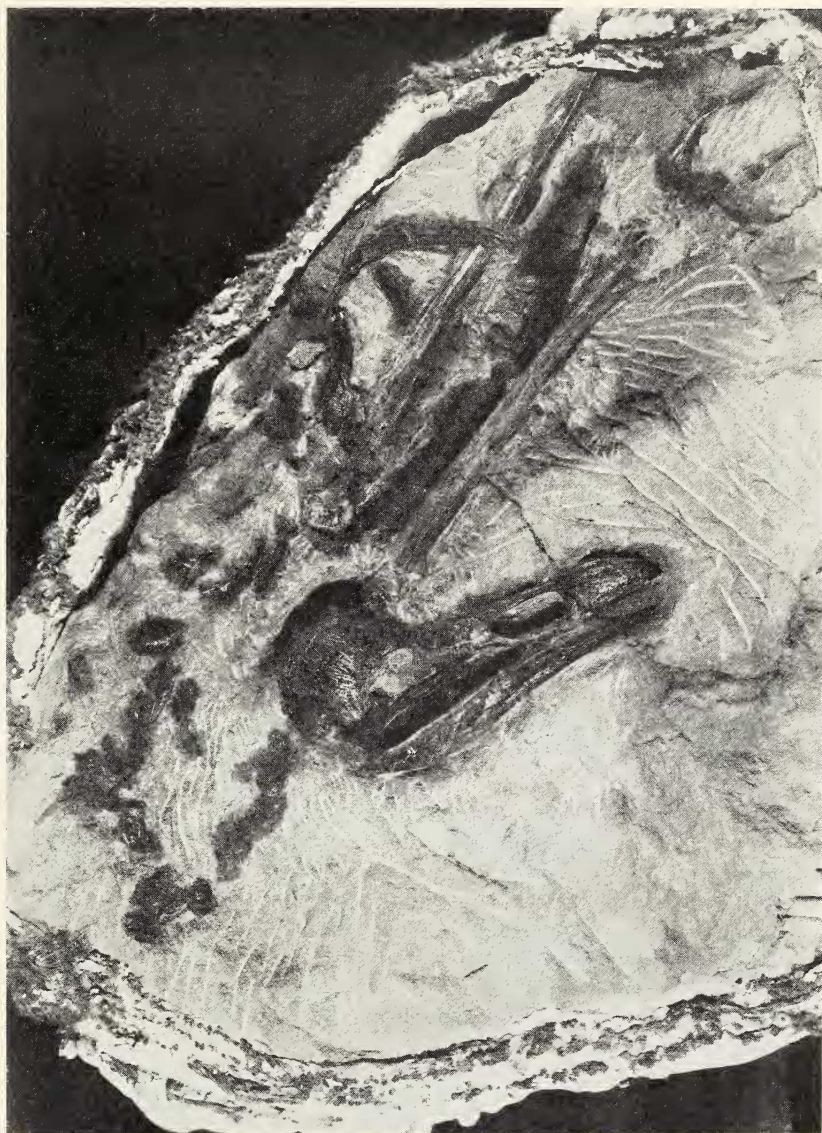
In the latter part of the Eocene in Wyoming, lakes of shallow water were frequent, with an abundance of fishes of the herring family. The horse-tail (*Equisetum*) was common, a fan palm, a climbing fern, and sumacs were found, and cat-tails grew in the water. Against such a setting a group of a half-dozen *Eocathartes* is shown in a variety of attitudes to demonstrate what it has been possible to deduce regarding

their bodily form and proportions. The head seemingly was covered with a thickened, vascular skin, and therefore may be supposed to have been bare of feathers, possibly to a lesser extent than in modern vultures. The tail is commonly somewhat elongated in long-legged terrestrial birds, and the proportions given the wing feathers are based on the relative sizes of the bones. After making an arbitrary choice of color pattern the actual colors may be left to the imagination, remembering that in our living vultures there is found a great variety ranging from the diversity of soft-hued tints shown by the king vulture, and the brighter colors of the bare head of this same king vulture and of the California condor, to the somber dress of the black and the turkey vultures. There is no color in the prismatic scale that is not indicated on one or another of this group of birds which ordinarily we think of as foul and unattractive scavengers. The somewhat slender form shown in *Eocathartes* has been developed from the weakened wing and coracoid which must have been accompanied by a slight development of the sternum and the muscles that covered it. The thickened neck is based on the strong cervical vertebrae and the evident attachments for heavy muscles that they display. The length of leg is easily seen in the fossil skeleton.

The peculiarities of *Eocathartes* are such that a new family, the Eocathartidae, is necessary to receive it, while similarly it is required that it be set off as a distinct superfamily, the Eocathartoidea. The distinctive characters for these two new groups are found in the specialized form, with degenerate wings, lengthened legs, and the other adaptations noted for a terrestrial life, together with the relatively considerable size of the skull, with its strong processes for muscular attachment and its large narial opening.

The schematic classification for the entire group of hawk-like birds will then stand as follows:

- Order FALCONIFORMES, Vultures, Hawks, Falcons.
- Suborder CATHARTAE, New World Vultures.
 - Superfamily EOCATHARTOIDEA, *Eocathartes* (fossil).
 - Family EOCATHARTIDAE, *Eocathartes* (fossil).
 - Superfamily CATHARTOIDEA, New World Vultures.
 - Family CATHARTIDAE, New World Vultures.
 - TERATORNITHIDAE, *Teratornis*, *Cathartornis* (fossil).
- Suborder FALCONES, Secretary-birds, Hawks, Falcons.
 - Superfamily SAGITTARIOIDEA, Secretary-birds.
 - Family SAGITTARIIDAE, Secretary-birds.
 - Superfamily FALCONOIDEA, Hawks, Falcons and Allies.
 - Family ACCIPITRIDAE, Hawks, Old World Vultures, Harriers.
 - PANDIONIDAE, Ospreys.
 - FALCONIDAE, Falcons, Caracaras.



The skeleton of *Eocathartes gallator* in the rock in which it was preserved, as it was brought to the Museum. Photograph by Sydney Prentice, slightly less than one-half natural size.

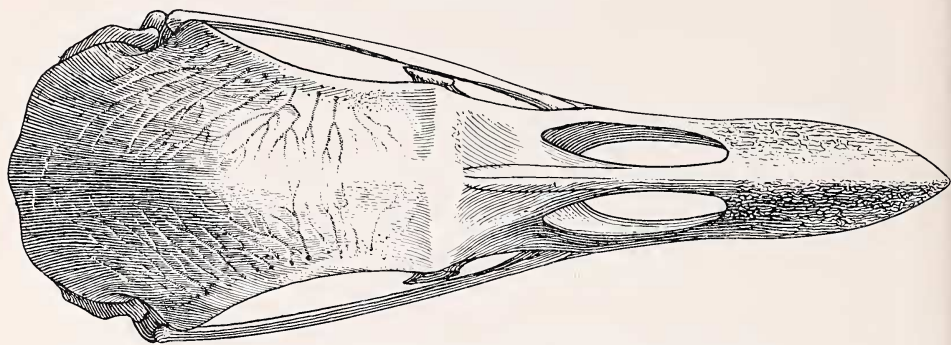
Eocathartes gallator

FIG. 1. Dorsal view of the skull, partly restored, slightly less than natural size.

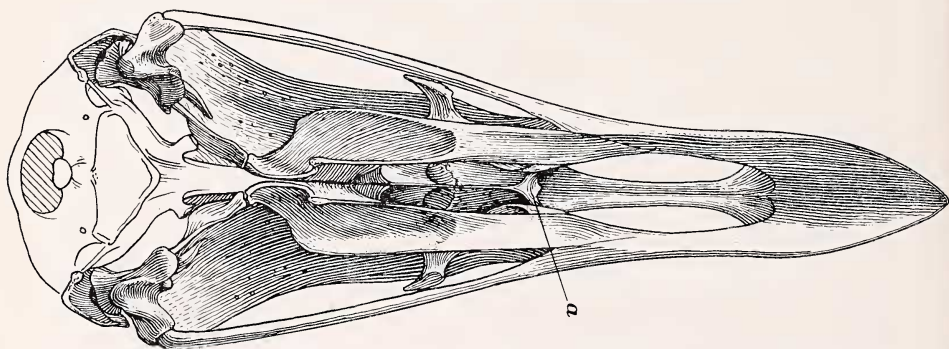


FIG. 2. Ventral view of the skull, partly restored. The un-shaded portion is not preserved in the specimen, but has been drawn from modern skulls of New World vultures. The bony bridge formed by fusion of the base of the maxillo-palatines and the nasal septum is marked at *a*. Slightly less than natural size.

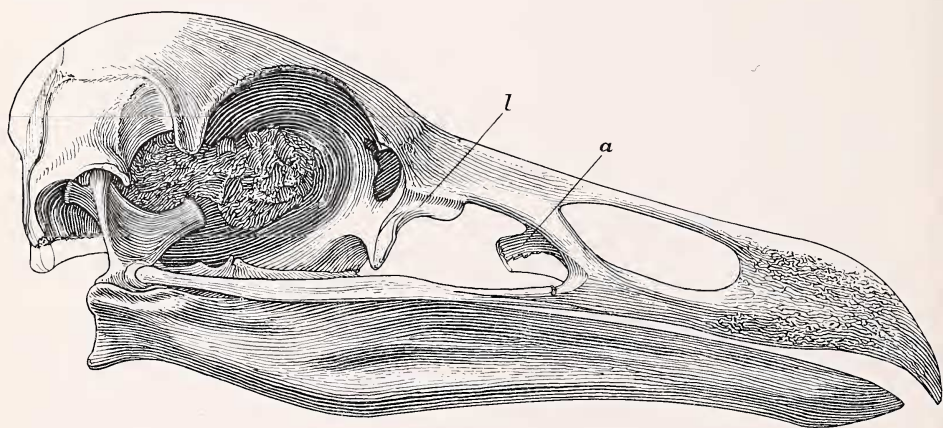
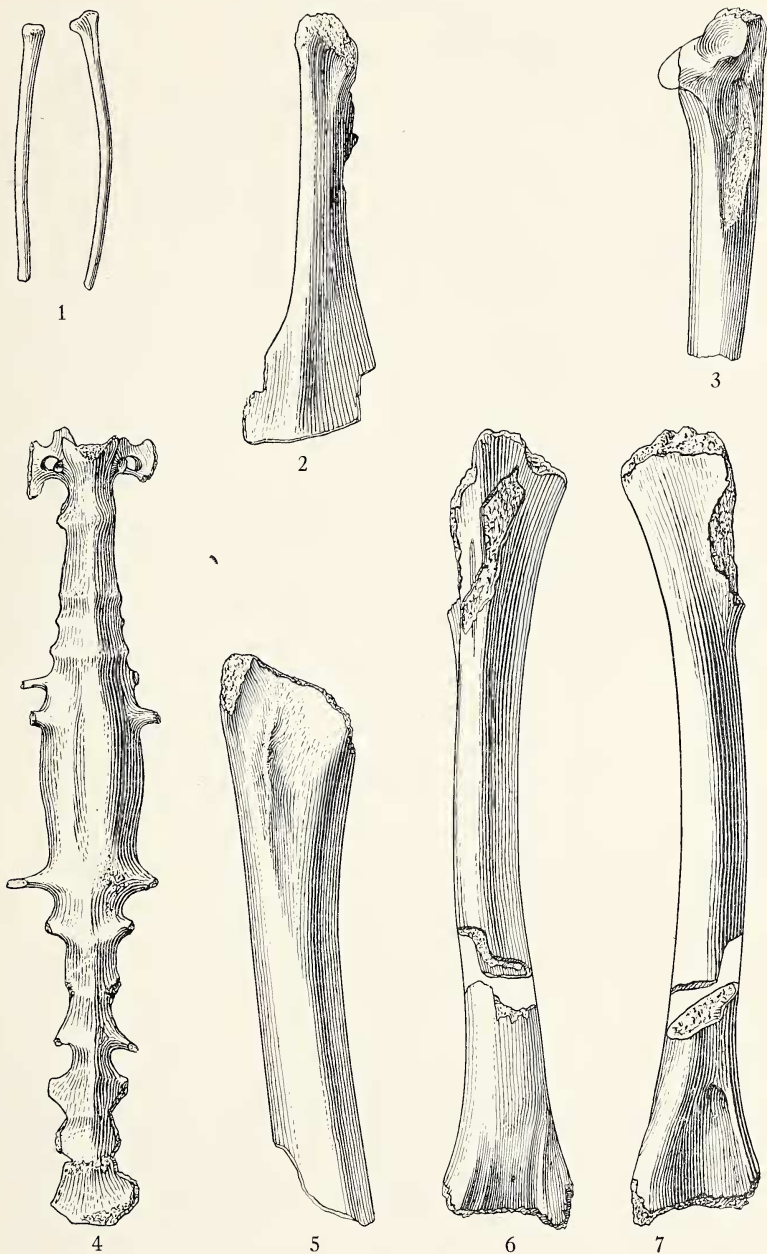


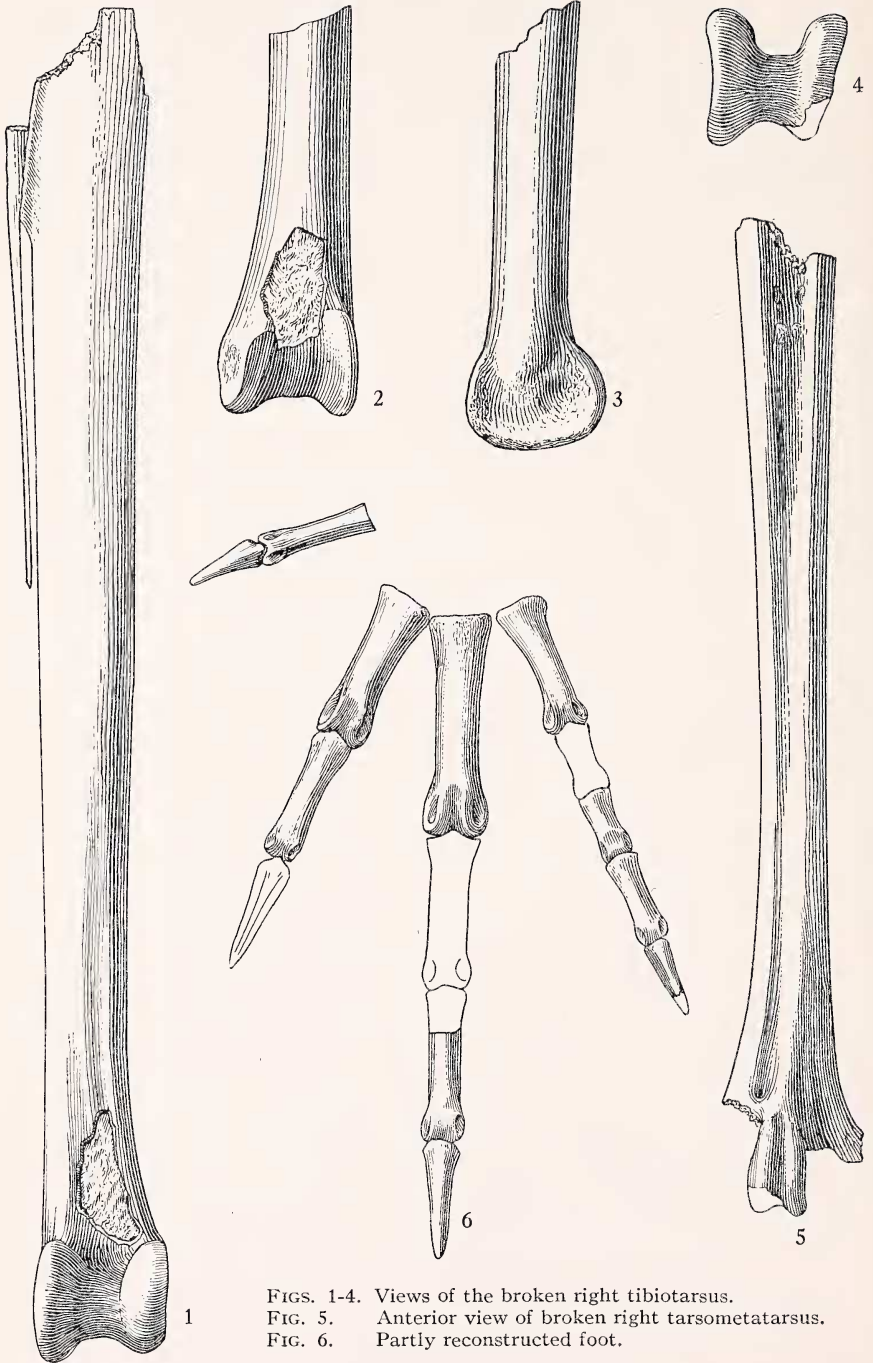
FIG. 3. Side view of the skull, partly restored. The fused lachrymal is marked at *l*, and the posterior part of the fused base of the maxillo-palatines and the nasal septum at *a*. About natural size.

Eocathartes gallator
All figures about natural size.



- FIG. 1. The basi-branchial bones of the tongue.
 FIG. 2. Anterior view of coracoid.
 FIG. 3. Proximal end of the right ulna.
 FIG. 4. Outline of the fused vertebrae found in the pelvis.
 FIG. 5. Dorsal view of fragmentary right femur.
 FIGS. 6, 7. Anterior and posterior views of the somewhat broken left humerus.

Eocathartes gallator
All figures about natural size.



FIGS. 1-4. Views of the broken right tibiotarsus.
FIG. 5. Anterior view of broken right tarsometatarsus.
FIG. 6. Partly reconstructed foot.